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PROFILES OF INTEREST IN HOLLAND'S THEORY IN RELATION TO
PERSONALITY AND SEX

by

Erica Lynn Mathis

A Dissertation
Submitted to the Graduate School,
the College of Education and Human Sciences
and the School of Psychology
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

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ABSTRACT

The current study sought to expand the knowledge of latent profiles of vocational interest that are interpreted from a theory-driven perspective. The current study utilized a measure of Holland's RIASEC interest types as a source of data to explore possible profiles through latent profile analysis. Using an MTurk sample of 303 adults, seven profiles were interpreted in the context of Holland's theory, specifically using diagnostic signs of the theory to explain possible profile membership. The seven profiles were coined Low Profile Elevation, High Consistency SIA, Moderate Consistency Conventional Investigative, Undifferentiated, High Differentiation Conventional Dominant, High Consistency Investigative Artistic, and High Profile Elevation. Additionally, the relationship between Five Factor Model personality variables and the profiles was explored. Extraversion and Openness to Experience were found to significantly differ across profiles. However, only Extraversion did so in the manner hypothesized. Sex was also utilized in the model to explore sex membership in the profiles, but no significant differences were found. Findings highlight the importance of career counseling practitioners' attention to the individual differences in vocational interests, specifically the incorporation of diagnostic signs in the interpretation of interest inventory results.

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DEDICATION

This work is dedicated to a number of special people in my life. Thank you to my partner, Wade, for being supportive and understanding of the time, effort, and sacrifice that completing graduate school entails. Thank you to my family for always being there to provide encouragement and love. Thanks to all of my friends and colleagues in the counseling psychology program and psychology department for your support and for always being there to chat when I needed to verbalize an idea to ensure that it made sense. Thanks also to all of my friends outside of graduate school, for keeping me sane and sincerely trying to understand all of the research conversations with which I bored you. Thanks to my dog, Scout, for being my constant companion, being patient when I don't have time for a long walk, and always being excited to see me. Finally, thanks to the McElroys for providing me with joy and entertainment throughout the beast that is graduate school.

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CHAPTER I - INTRODUCTION

In John Holland's last comprehensive account of his theory in 1997, he references the theory as the Theory of Vocational Personality and Work Environments. This emphasizes the theory's assumptions to account for individuals' personality as well as environments in which people operate. Although the entire scope of Holland's theory is beyond this paper, there are numerous publications that detail its creation and development (e.g., Holland, 1997; Nauta, 2010; Reardon & Lenz, 2015). The current study utilized Holland's six hypothesized work personalities and environments, typically stated as the acronym, RIASEC (i.e., Realistic, Investigative, Artistic, Social, Enterprising, and Conventional). There is also a group of diagnostic signs that allow for a more nuanced interpretation of Holland's RIASEC typology. These indicators are referred to by multiple names including diagnostic signs, secondary constructs, secondary assumptions, and personality patterns. The current study will refer to these indicators using the term diagnostic signs. Ultimately, this study provides empirical support for the integration of theoretically-consistent diagnostic signs into the interpretation of RIASEC-based interest inventory results.

Holland's theory guided this research in an attempt to more fully integrate theory and research into the study of interest profiles. This is particularly important as recent research related to profiles of interest has limited evidence of being fully grounded in theory. While it is promising that the field of vocational psychology has begun to utilize person-centered approaches to studying interest (e.g., examining interest profiles), the research and its applied implications would be more compelling if studies were well integrated with theory. Advancing the understanding of Holland's theory is critical due to

the proliferation of the theory in practice. Holland's theory is likely the most influential theory of career development and has been applied to career counseling, industry, personal concerns, and labor market information around the world (e.g., Nauta, 2010; Wille, De Fruyt, Dingemans, & Vergauwe, 2015). It is essential we continue our understanding of how Holland's theory applies in today's world and in a variety of contexts. Thus, the aim of the current study was to examine Holland's theory from a person-centered approach by exploring latent profiles of vocational interest and how they may be explained in the context of Holland's theory using the aforementioned diagnostic signs. It is also essential that we continue our understanding of the relationship between Holland's theory and some of its common correlates. Thus, the current study examined the relationships between profiles of vocational interest and other variables of interest. These variables included sex and the Five Factor Model's personality variables (i.e., Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) (Tupes & Christal, 1961). It is important to include these variables in our growing understanding of Holland's theory, as these variables are often included in variable-centered studies of the theory. Including these variables in the current study adds another layer of understanding of how Holland's theory relates to personality and sex in a person-centered context.

Diagnostic Signs

Diagnostic signs in Holland's Theory include coherence, congruence, consistency, differentiation, identity, and profile elevation. Applicable diagnostic signs (i.e., consistency, differentiation, identity, and profile elevation) were used to guide the hypothesis formation in the current study. This had not been a practice in recent, relevant

research (e.g., McLarnon, Carswell, & Schneider, 2015). Diagnostics signs are important in understanding the nuances of Holland's typology and how it is expressed differently across individuals. In 1997, Holland stated that the use of these diagnostic signs would not only provide clarity to the interest profile but could represent a variety of personality patterns. Therefore, it was expected that the current study would reveal latent profiles whose membership could be at least partially explained by the influence of these diagnostic signs on RIASEC interests.

Profile Elevation

Profile elevation is a diagnostic sign defined as the overall level of "likes" across an interest measure (Holland, Johnston, & Asama, 1994) and serves as a quick and simple method of assessing individuals' level of overall interest. It has been positively correlated with Extraversion, Openness to Experience, and Conscientiousness and negatively correlated with Neuroticism and depressive traits (Bullock & Reardon, 2008; Fuller, Holland, & Johnston, 1999; Gottfredson & Jones, 1993; Holland et al., 1994). McLarnon et al. (2015) identified a Disinterested profile in which individuals appeared to have lower overall levels of interest compared to other individuals. This profile interpretation is very similar to the description of individuals who have low profile elevation. Therefore, the current study hypothesizes a similar profile will emerge but we will interpret that profile within the known theoretical context of the profile elevation diagnostic sign.

Differentiation

Differentiation refers to how much an individual's or environment's RIASEC profile is defined or resembles a RIASEC type (Holland, 1997). Some individuals more

strongly endorse one area or RIASEC type over all other types. These individuals would be considered highly differentiated. Alternatively, an individual whose endorsement level of several RIASEC types is very similar would have an interest profile characterized by undifferentiated interests (Holland, 1997; Reardon & Lenz, 1999). McLarnon et al. (2015) identified a Neutral profile in which individuals appear to have very similar scores across all the RIASEC interests, which could be interpreted within the diagnostic sign differentiation. The current study hypothesizes a similar profile will emerge but we will interpret that profile within the known theoretical context of undifferentiated interests.

Consistency

The diagnostic sign of consistency refers to the degree of similarity between Holland's RIASEC personality/environment types (Holland, 1997). This is illustrated in Holland's hexagonal model by examining the distance between two types on the hexagon. For instance, Social and Enterprising types are more alike than Social and Realistic types as Social and Enterprising are adjacent on the hexagon and Social and Realistic are diametrically opposed to one another.

Related to consistency, the bipolarity assumption states that individuals are not likely to score highly on interest areas that are directly opposite of each other on the hexagonal model (e.g., Realistic and Social). However, Tay, Su, and Rounds (2011) found that RIASEC interests appearing on opposite sides of the hexagonal model can be incorporated into one interest profile. This is different from prior research which utilized the bipolarity assumption to imply that interests on opposite sides of the hexagonal model (or opposite poles) are unlikely to co-occur. McLarnon et al. (2015) noted this research in their study and mentioned the how the use of a person-centered approach to examine

vocational interest could be useful in identifying ways to conceptualize RIASEC interests without the constraints of a bipolar model. The findings from Tay et al. (2011) and McLarnon et al. (2015) could explain the tenuous reputation of the consistency diagnostic sign in that the assumption of bipolarity in the hexagonal model and its assumed outcomes may be, for many individuals, not applicable. The current study seeks to further this investigation and seek to explain the lack of bipolarity in vocational interests using the diagnostic sign of consistency.

Identity

Vocational identity, or simply identity, is a diagnostic sign that was introduced by Holland in the 1985 revision of his theory (Holland, 1985; Nauta, 2010). Identity refers to “an estimate of the clarity and stability of a person’s identity or the identity of an environment” (Holland, 1997, p. 5). Holland went on to specify his diagnostic sign of identity to mean an individual having a “clear and stable picture” of his/her “goals, interests, and talents” and an environment having “clear and integrated goals, tasks and rewards that are stable over long time intervals” (1997, p. 5; Holland, Gottfredson, & Power, 1980).

Because having highly differentiated interests and a more consistent profile is also associated with a clearer and more stable set of interests, the current study hypothesized that levels of vocational identity would vary across latent profiles of interest based on the differentiation and consistency of interests within the profiles. This hypothesis is an important extension of the McLarnon et al. (2015) findings that did not include an assessment of vocational identity. Also, the current study will provide more evidence regarding the relationship between vocational identity and RIASEC interests.

Person Centered Approach

There has been a call for more integration of theory, research, and practice in the vocational psychology literature (Sampson, Bullock-Yowell, E. Dozier, Osborn, & Lenz, 2017). The current study aimed to further this integration by taking a person-centered approach to researching vocational interests. In this approach, relationships among variables are explored based on how they differ among individuals as opposed to simply exploring general associations between variables (i.e., variable centered approach; Laursen & Hoff, 2006). This approach (i.e., latent profile analysis) was chosen as a way to examine vocational interests because it is more conducive to the structure of vocational interests themselves. Further, vocational psychology research is often girded in the practical implications of its findings. When researchers discuss practical implications from their findings, the recommendations for approaching clients engaged in career counseling come from studies using a variable-centered approach. This is troubling in that the variable-centered approach assumes that all individuals in the population being studied are affected by the predictor variables in the same way (Laursen & Hoff, 2006). Magnusson, who has published influential work regarding the person-centered approach to research, stated in a 2003 publication that, “It is only when a statistical tool matches the character of the phenomena—that is, when it is linked to an analysis of the phenomena under investigation—that it can contribute to scientifically solid answers to relevant questions” (p. 13). Therefore, it seems that there is a disconnect in the research being conducted regarding vocational interests and the resulting recommendations. Because much of the literature in vocational interests notes the importance of individual differences in applying theories and interpreting assessments, it seems unusual that the

overwhelming majority of vocational interest research has been conducted using variable-centered approaches. If there is such importance in the individual differences of persons' vocational interests, then the most applicable approach to research of vocational interests would be an approach that does not assume the same effects of variables across individuals (i.e., person-centered approach). Some recent research has utilized person-centered approaches to better understand the structure of vocational interests in a way that integrates theory and practice (e.g., Leuty, Hansen, & Speaks, 2015; McLarnon et al., 2015). The current study expanded on this new body of research.

Five Factor Model

The current study utilized the constructs of the Five Factor Model (i.e., Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) to examine their relationship to the hypothesized latent profiles of vocational interest. As with Holland's theory, the entire scope of the Five Factor Model is beyond this paper. However, there are also numerous publications that describe the inception and development of the model (e.g., Tupes & Christal, 1961; McCrae & John, 1992).

As research on the commonalities between vocational interests and personality mounted, there has been ample material from which to draw upon for meta-analyses. A study conducted by Barrick, Mount, and Gupta (2003) indicated that vocational interests and personality are modestly related. The most robust relationships were found the RIASEC type of Enterprising and the Five Factor Model dimension of Extraversion as well as the RIASEC type of Artistic with the Five Factor Model dimension of Openness to Experience (Barrick et al., 2003). Mount, Barrick, Scullen, and Rounds (2005) found that Extraversion was positively correlated with Enterprising and Social interests and

Openness to Experience was positively correlated with Artistic and Investigative interests. Correlations between other personality factors and interests were lower than .20 (Mount et al., 2005).

The current study also seeks to explore the relationship between the diagnostic signs of profile elevation and consistency and the personality variables of Conscientiousness, Openness to Experience, Neuroticism, and Extraversion. Profile elevation has been found to be related to Extraversion and Neuroticism (e.g., Bullock & Reardon, 2008; Fuller et al., 1999). Consistency has been found to be related to Conscientiousness (e.g., McLarnon et al., 2015). Although consistency has not been directly related to Openness to Experience, low consistency has been described as a unique configuration of interest scores (Tracey, Wille, Durr, & De Fruyt, 2014) and Openness to Experience has been described as having a wide range of interests (McCrae & John, 1992). Further, the research of McLarnon et al. (2015) indicated relationships between Conscientiousness, Extraversion, and Openness to Experience and the eight profiles found in their study. Specifically, they found that Conscientiousness was highest among individuals within the entrepreneur profile. They also found Extraversion to be the lowest in individuals within the Investigative-Dominant profile. Finally, they found that Openness to Experience was highest in individuals within the Conventional-Business profile. Therefore, the current study will explore the relationships found between the aforementioned constructs in past literature as well as hypothesize a new relationship (i.e., positive relationship between low consistency and Openness to Experience).

Sex Differences in Vocational Interests

As mentioned by Johnson and Bouchard (2009), many vocational interest measures were initially developed during a time when there were assumptions about work interest that “varied dramatically by sex” (Johnson & Bouchard, 2009, p. 7). There has been a substantial amount of research regarding sex differences in vocational interests (e.g., Anderson, Tracey, & Rounds, 1997; Dinella, Fulcher, & Weisgram, 2014). However, this research has found conflicting evidence regarding the presence or absence of sex differences. Gottfredson (1981) was the first to bring attention to potential sex differences in vocational interests in her Theory of Circumscription and Compromise. She introduced the idea of sex-typing occupations, a process in which certain occupations are considered to be more masculine than feminine, or vice versa (Gottfredson, 1981). Sex-typing as described by Gottfredson relates to the RIASEC model in that jobs predominantly characterized by Realistic, Investigative, and Enterprising interests tend to be viewed as masculine while jobs predominantly characterized by Conventional interests tend to be viewed as feminine. Jobs predominantly characterized by Social and Artistic interests tend to be viewed as neutral or equally masculine and feminine. This structure is supported by research. For example, Helwig (2002) found that children have a tendency to sex-type occupations and to prefer jobs congruent with their identified gender. However, other research refutes the claim that individuals engage in similar occupational sex-typing regardless of identified gender. Hansen, Collins, Swanson, and Fouad (1993) found that women and men perceive the RIASEC interest types and the relations between the types differently. For instance, they found that men discriminate between the Realistic and Investigative types more so than do women. They concluded that the structure of the

RIASEC model is different for women and that alterations to the theory should be made to accommodate the differences in women's perception of vocational interest. In contrast, Anderson et al. (1997) found no significant differences in the fit of the RIASEC model based on sex. The authors posit that previous results regarding sex differences in the RIASEC structure were due to differences in occupational preference. However, their study was limited by its very low sample size (i.e., 14 participants). Kantamneni (2014) also found that Holland's model of vocational interest types was an equally good fit for men and women while examining the fit of the model in various racial/ethnic groups. Such contradictions in findings have strong implications for current initiatives to encourage women to more fully participate in the STEM fields which are environments largely defined by the Realistic and Investigative areas (Su, Rounds, & Armstrong, 2009).

Participants' sex has also been taken into account in the research examining the RIASEC and Five Factor Model relationships. For instance, Schinka, Dye, and Curtiss (1997) found that the Five Factor Model was related to Investigative and Conventional types in women only. Specifically, "the FF model appears to ignore interest and activity patterns measured by the Realistic scale and provides coverage of the Investigative and Conventional dimensions in women only," (p. 366). Meaning, Schinka et al. (1997) found no relationship between the Five Factor Model variables and Realistic vocational interests and found a relationship between the Five Factor Model variables and Investigative and Conventional interests in female participants only. Further, the RIASEC model was related to the Conscientiousness variable in women only. In contrast, the study by Larson, Rottinghaus, and Borgen (2002) did not find meaningful differences in

the relationship between vocational interests and personality variables based on sex. Kieffer, Schinka, and Curtiss (2004) found that the interaction between the Five Factor Model personality variables of Agreeableness and Conscientiousness and the diagnostic sign of differentiation significantly explained variance in the outcome of work performance for men. They also found that the interaction of the Five Factor Model personality variables of Agreeableness and the RIASEC types of Artistic and Social with the diagnostic sign of congruence was significantly related to the work performance of women. Further, the interaction between the FFM and RIASEC with diagnostic signs of differentiation, consistency, and congruence produced statistically findings (albeit weak) only when analyses were separated on the gender variable (Kieffer et al., 2004). The current study was similar to McLarnon et al. (2015) in that profile membership by sex was examined when exploring profiles of interest to account for potential differences in interests due to sex.

Present Study

The current study sought to examine how latent profiles of Holland's RIASEC interests can be explained by the theory-consistent diagnostic signs of Holland's theory. This was accomplished using the person-centered approach of latent profile analysis to expand the literature on the variables of interest in a more practically applicable manner. Profiles found by McLarnon et al. (2015) seemed to align with diagnostic signs in Holland's theory, but were not explained in the context of those constructs in their study. The current study sought to improve upon the conceptualization of latent profiles of RIASEC interests by utilizing existing constructs in Holland's theory to explain emergent profiles. Because the instrument used in the current study to measure RIASEC interests is

more directly related to the RIASEC types themselves, confidence in the findings were more robust, as well as facilitated a better integration of the research findings with theory and typical practice. Additionally, the current study examined the relationship between RIASEC interest profiles and personality and sex. Related to sex, recent research such as the McLarnon et al. (2015) study has utilized samples that are largely female and found many female-dominant profiles. Therefore, the current study employed methods to seek a more gender-balanced sample. The present study sought to answer the following questions:

Research Question 1: When using a measure of Holland's theory to measure vocational interests, how many and what kind of latent profiles exist in the data?

Research Question 2: When examining profiles of vocational interests, how do personality variables of the Five Factor Model relate to these profiles?

Research Question 3: When examining profiles of vocational interests, do differences exist in the configuration of profiles present based on an individuals' sex?

Hypotheses include:

Hypothesis 1: Latent Profile Analysis (LPA) will reveal multiple subgroups/profiles with differing levels of the RIASEC interest areas that align with diagnostic signs of Holland's theory.

Hypothesis 1a: One of the identified groups will be defined by low profile elevation or low interest across all levels of RIASEC interest akin to McLarnon et al.'s (2015) "Disinterested" profile.

Hypothesis 1b: One of the identified groups will be defined by high profile elevation or high interest across all levels of RIASEC interest.

Hypothesis 1c: One of the observed groups will be characterized by an undifferentiated profile or equal levels of RIASEC interest, regardless of profile level, akin to McLarnon et al.'s (2015) "Neutral" profile.

Hypothesis 1d: Consistent with findings such as the Realistic-Artistic-Conventional profile from McLarnon et al. (2015), one of the observed groups will be characterized by low consistency profiles or interest combinations not adjacent on the hexagon.

Hypothesis 1e: One of the observed groups will be characterized by high consistency profiles or combinations of interests adjacent on the hexagon, akin to the McLarnon et al. (2015) "Realistic-Investigative-Artistic" and "Artistic-Dominant" profiles.

Hypothesis 1f: Consistent with Holland's theory and previous research, vocational identity will be significantly related to profiles characterized by low profile elevation, low differentiation, or low consistency.

Hypothesis 1g: Consistent with Holland's theory and previous research, vocational identity will be significantly related to profiles characterized by differentiated interests.

Hypothesis 2: RIASEC interest latent profiles will be related to Five Factor Model variables.

Hypothesis 2a: Profiles with low profile elevation will be related to Extraversion.

Hypothesis 2b: Profiles with high profile elevation will be related to Neuroticism.

Hypothesis 2c: Profiles with low consistency will be positively related to
Openness to Experience.

Hypothesis 2d: Profiles with high consistency will be related to
Conscientiousness.

Hypothesis 3: The configuration of profiles will differ based on sex.

Hypothesis 3a: Profiles high in Realistic, Investigative, and/or Enterprising
interests will be more prevalent in men.

Hypothesis 3b: Profiles high in Conventional interests will be more prevalent
in women.

Hypothesis 3c: Consistent with the findings cited by Schinka et al., (1997),
profiles significantly related to Neuroticism will be more prevalent in
women.

Hypothesis 3d: Consistent with the findings cited by Kieffer et al., (2004),
profiles significantly related to Agreeableness will be more prevalent in men.

CHAPTER II - METHOD

Participants

The current study's sample consists of adults recruited from Mechanical Turk (MTurk). MTurk is a participant recruitment website that is operated by Amazon.com. MTurk is mainly used to recruit individuals who can complete tasks requiring human intelligence, such as coding visual data (Buhrmester, Kwang, & Gosling, 2011). These individuals are compensated for their time by a fee predetermined by the task managers (Buhrmester et al., 2011). Participants recruited through MTurk are typically paid between five and ten cents for tasks that take up to ten minutes (Buhrmester et al., 2011). Participants in this study were offered 25 cents to complete the entire survey. This amount was chosen to compensate participants' time and offer a higher incentive to complete the task.

A sample containing individuals from various races, ethnicities, occupations, and geographical locations was of interest to the present study due to the call for a more diverse sample by McLarnon et al. (2015). Occupations reported by the participants varied across RIASEC areas with the most frequent occupations reported to be teacher and student. However, participants were allowed free response and the reported occupational titles varied widely, from electrician to purchasing agent. Three hundred fifty participants were recruited from MTurk, and 47 of those participants were removed due to invalid data. These cases consisted of participants who were not in the United States (N=4), failed validity items (N=24), did not consent to participate (N=1), and attempted to complete the survey advertised for the opposite sex (N=18). The survey was advertised separately for men and women on MTurk, but each survey was constructed

and compensated identically. This separation was only to ensure equal sampling from both male and female participants. However, participants who entered the surveys meant for the opposite sex were exited when they reported their sex (e.g., a male who entered the female survey and reported being male would be exited). These participants were not compensated for entering the survey; however, there were no restrictions in place to prevent them from then entering the correct survey.

Data from 303 participants were used for the current study, which is consistent with the sample size obtained by McLarnon et al. (2015). This number of participants falls within the acceptable number of participants found in other literature utilizing latent profile analysis (e.g., Nylund, Asparouhov, & Muthén, 2007). Previous literature indicates that samples of MTurk workers have significantly diverse demographic information (i.e., ethnicity, gender, socioeconomic status, age; Arditte, Çek, Shaw, & Timpano, 2016; Mason & Suri, 2012; Paolacci, Chandler, & Ipeirotis, 2010). Demographic information for the current sample can be seen in Table 1.

Table 1 Demographic Characteristics of Sample

Characteristic	<i>n</i>	%
Gender		
Female	153	50.5
Male	150	49.5
Race		
White	236	77.9
Asian/Pacific Islander	26	8.6
Hispanic	16	5.3

Table 1 Continued

Other	12	4
Black or African American	11	3.6
American Indian/Alaskan Native	2	.7
Employment Status		
Employed	246	81.2
Not Employed	57	18.8
Hours Worked Per Week		
1-10	37	12.2
11-20	31	9.8
21-30	17	5.7
31-40	109	35.9
41-50	64	21.2
51-60	13	4.2
60 +	17	5.6
No answer	15	5

Procedure

Participants were recruited with the approval of the university's Institutional Review Board. An online survey consisting of an informed consent statement, a demographics form, and measures of the study was advertised on MTurk. The survey was hosted on Qualtrics, a website used for data collection, and linked to MTurk. Despite the evidence of significant reliability of data from MTurk participants (Paolacci et al., 2010), extra precautions were taken to ensure the quality of the data in the current study via three directed response items as recommended by Meade and Craig (2012). Participants were informed at the beginning of the study that they would not be compensated if they were deemed to be carelessly responding (i.e., failed one of the bogus questions).

Additionally, all measures except for the demographics form were counterbalanced. The demographics form was presented last to collect demographic information from only participants who completed all of the study measures.

Measures

A demographic form and the measures for the current study were administered to the participants as outlined in the Procedures section.

*The O*NET Interests Profiler* (National Center for O*NET Development, 1999) determined participants' RIASEC scores and provided the information necessary to calculate the diagnostic signs of profile elevation, differentiation, and consistency. It provides a direct measurement of RIASEC scores, unlike indirect measure of RIASEC-based interests such as the Jackson Career Explorer (JCE; Schermer, MacDougall, & Jackson, 2012) utilized in the McLarnon et al. (2015) study. The 180 item measure includes 30 items for each of the RIASEC types (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional) that represent work activities within the type. Scores are determined by the number of self-reported "likes." A high number of "likes" in a RIASEC indicates a strong level of interest in that vocational type. The possible range of scores on each scale is 0 to 30.

Profile elevation was calculated by summing the RIASEC scale scores. Differentiation was calculated using Iachan's (1984) formula in which the second and fourth highest RIASEC scores are summed and divided by two, subtracted from the highest RIASEC value, and then multiplied by 0.5 (Iachan, 1984). This formula is regularly used in research to calculate differentiation (e.g., Buboltz & Woller, 1998; Leung, Conoley, Scheel, & Sonnenberg, 1992). Consistency was calculated using

Holland's (1997) method, in which the top two RIASEC scores are examined in relation to their position to each other on the hexagonal model. Specifically, scores that are adjacent on the hexagon model (e.g., R and I) receive a score of 3, scores that are near on the model (e.g., R and A) receive a score of 2, and scores that are opposite on the model (e.g., R and S) receive a score of 1.

Alpha coefficients of the RIASEC types in the O*NET Interests Profiler indicated high levels of internal consistency ($\alpha = .95-.97$) (Lewis & Rivkin, 1999). Test-retest reliability of the RIASEC types are high, with correlations ranging from .91-.97 for a one month delay (Rounds et al., 1999). Russell (2007) found the Kappa coefficient between the Self-Directed Search 1994 Edition (Harmon, Hansen, Borgen, & Hammer, 1994) and the O*NET Interest Profiler to be .45, suggesting adequate evidence of convergent validity for Interest Profiler scores. Internal consistency for the current sample was high ($\alpha = .94-.96$).

The International Personality Item Pool (IPIP; Johnson, 2014) was used in the current study to assess participants' personality as defined by the Five Factor Model. The 120-item version created by Johnson (2014) was used in the current study and includes 24 items for each of the five personality factors (Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism). Participants responded to each item with a 5-point Likert scale ranging from 1 (*disagree strongly*) to 5 (*agree strongly*). Scores are calculated by adding the participants' ratings across the scales after the required items have been reversed-scored. Higher scores indicate an individual's match with the corresponding scale. The possible range of scores on each scale of the Five Factor Model scales is 24 to 120. Alpha coefficients of the Five Factor

Model personality scales in the IPIP indicated high levels of internal consistency ($\alpha = .83-.90$; Johnson, 2014). Internal consistency for the current sample was high ($\alpha = .85-.93$).

My Vocational Situation (MVS; Holland, Daiger, & Power, 1980) was used in the current study to assess participants on the diagnostic sign of vocational identity. The measure includes 20 items that use true/false or yes/no format to assess individuals' clarity regarding their vocational identity. The vocational identity (VI) subscale was utilized in the current study and consists of 18 items with a true-false response option. Scores for this scale are calculated by summing the number of false responses. The highest score possible is 18 and higher scores indicate higher vocational maturity. Holland et al. (1980) utilized the Kuder-Richardson 20 instead of Cronbach's alpha and found that the reliability for the VI in their sample was .86. Further, Werner (2017) found the VI scale to have a reliability of $\alpha = .89$ in a sample of college students. The current study produced reliability of $\alpha = .85$ in a sample of adults.

Data Analysis

Latent profile analysis (LPA) was performed to examine the presence of independent interest profiles and their relationships with gender and personality factors. LPA can either be conducted in an exploratory or confirmatory approach. Although the current study sought to build upon the McLarnon et al. (2015) study, the analyses in the current study utilized an exploratory approach due to the use of a different measure of vocational interests.

Although there are many acceptable criteria for determining the number of profiles in LPA, criteria for the current study was chosen based on the McLarnon et al. (2015) study and other studies in the vocational psychology literature using latent profile

analysis or factor mixture modeling or (e.g., Johnson & Bouchard, 2009; Leuty et al., 2015). McLarnon et al. (2015) chose to utilize the Bayesian Information Criteria (BIC; Schwarz, 1978), the adjusted BIC (aBIC; Sclove, 1987), and the bootstrap likelihood ratio test (BLRT; McLachlan & Peel, 2000). Simulation studies have differing results related to which criteria is superior (e.g., Nylund et al., 2007; Tofighi & Enders, 2008; Yang, 2006). However, most research employing LPA utilize a combination of the aforementioned indices, as well as considering entropy, posterior probabilities, and interpretability of groups. All of these were considered when determining a profile solution for the current study.

Another consideration in the use of LPA is the assumption of conditional independence. This assumption states that the variables being explored in the analyses are not significantly correlated within classes or groups. Instead, group membership in LPAs should explain correlations among variables. Previous research indicates that vocational interests are highly correlated (Johnson & Bouchard, 2009; Leuty et al., 2015; Tay et al., 2011), which increased the likelihood that the assumption of conditional independence would have been violated in the current study. Therefore, common factor models, or factor mixture models (FMM), have been utilized in other studies which explore vocational interests using person-centered approaches (e.g., Leuty et al., 2015; McLarnon et al., 2015). In the current study, a FMM was attempted but a well-fitting model solution was not identified. This could be due to the common factor that was added. Some literature has examined criticisms of the general interest factor, which is the common factor modeled in FMMs of vocational interest, as actually being a measure of profile elevation and/or simply a nuisance variable with little impact (e.g., Tracey, 2012). Other

diagnostic signs such as consistency may also be encompassed by the common factor, as some of the shared variance that is supposed to be explained by the common factor may be related to the consistency of individuals' vocational interests. Regardless of the reason, a FMM such as the one conducted in the McLarnon et al. (2015) study could not be successfully replicated with the current study data. Although Bayesian estimators can be used to relax the assumption of conditional independence (e.g., Asparouhov & Muthén, 2011), this approach in LPA and FMM "has yet to see widespread application" (McLarnon et al., 2015, p. 182). Because the common factor may have been complicated by the aforementioned reasons and because the use of Bayesian estimators in LPA is not widely used, it was decided that LPA was a better fit for the data in the current study.

In addition to simply exploring the number and structure of latent profiles of vocational interest present in the data, the current study used theory-consistent diagnostic sign scores of profile elevation, differentiation, consistency, and identity to examine mean differences in the RIASEC types within the profiles produced. This was done to examine the validity of the hypothesized profiles. The current study also examined possible sex differences in profile membership as well as the relationship between Five Factor Model personality traits and the latent profiles. The mean differences between profiles found in the current study and the aforementioned variables of interest were examined (i.e., Wald's test) to determine the validity of the hypothesized relationships. This was done by adding the aforementioned variables as auxiliary variables in the model. Although variables can be entered as covariates, the current study employed the auxiliary approach in a similar manner to McLarnon et al. (2015) as the current study also taking an exploratory approach to determining the appropriate number of classes.

CHAPTER III - RESULTS

Correlations and LPA Results

The descriptive data and correlations between the RIASEC, diagnostic signs, FFM, and sex variables are presented in Table 2. LPA models were run utilizing solutions that ranged from two groups to ten groups. Fit indices for these solutions can be found in Table 3. Nylund et al. (2007) recommend BIC as the fit index to determine number of classes, by choosing the class solution with the lowest BIC value. The seven-group solution had the lowest BIC value ($BIC = 4663.33$). When examining the BLRT significance values, it appears that all the models from the two- to ten-class solution represented a significant improvement in fit. Although the BIC value for the seven-group solution was the lowest, the eight-, nine-, and ten-group solutions were considered because of the BLRT values. Each solution's RIASEC variable means were graphed to consider their interpretability. However, it appears that the classes added in these solutions were not clearly different from groups in the seven-class solution. These additional classes also had low membership and were difficult to interpret in the context of Holland's theory. Many researchers have suggested that class solutions be determined by not only fit indices, but also factors such as theory, parsimony, and profile interpretability (e.g., Berlin, Williams, & Parra, 2014; Geiser, 2013). Thus, the seven-class solution seemed to be the best fit when considering both fit indices and the aforementioned factors. The posterior probabilities of the seven-class solution indicate a high probability of classification into one of the seven classes, which also suggests the presence of seven distinct profiles. These probabilities can be seen in Table 4.

Table 2 *Correlations, Means, and Standard Deviations of Study Variables*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Realistic	1															
2 Investigative	.493**	1														
3 Artistic	.211**	.462**	1													
4 Social	.353**	.524**	.466**	1												
5 Enterprising	.506**	.445**	.370**	.529**	1											
6 Conventional	.268**	.244**	.047	.319**	.537**	1										
7 Sex	-.315**	-.066	.074	.141*	-.089	.076	1									
8 Profile Elevation	.669**	.764**	.606**	.765**	.797**	.587**	-.036	1								
9 Consistency	.091	.129*	.124*	-.104	-.012	-.147*	-.098	.016	1							
10 Differentiation	-.282**	-.112	-.077	-.282**	-.353**	-.064	.011	-.272**	.198**	1						
11 Vocational Identity	-.041	-.015	-.053	-.010	-.042	-.038	.051	-.047	-.063	.053	1					
12 Neuroticism	-.114*	-.094	-.076	-.112	-.196**	-.004	.149**	-.138*	-.015	-.054	-.437**	1				
13 Extraversion	.094	.161**	.250**	.288**	.353**	.038	-.022	.276**	.028	-.079	.285**	-.584**	1			
14 Openness to Experience	-.036	.328**	.049**	.163**	.038	-.066	.160**	.221**	.116*	.058	.085	-.064	.248**	1		
15 Agreeableness	-.036	.115*	.148*	.241**	-.059	.052	.161**	.117*	-.102	.130*	.209**	-.325**	.182**	.226**	1	
16 Conscientiousness	.004	.014	-.039	.084	.065	.104	.036	.057	-.037	.124*	.434**	-.575**	.345**	-.013	.317**	1
Mean	9.39	14.79	12.38	11.23	8.89	12.34	1.50	69.03	2.34	4.48	10.22	64.52	74.22	81.39	91.52	92.46
Standard Deviation	8.75	9.71	8.89	9.35	7.88	9.91	0.50	37.91	0.71	2.67	4.65	18.82	15.73	13.28	13.07	14.63

Note. **. Correlation is significant at the 0.01 level. *. Correlation is significant at the 0.05 level.

Table 3 LPA Fit Statistics for 2- to 10-Group Models

	AIC	BIC	aBIC	Entropy	BLRT	BLRT p
2 Groups	4739.65	4810.21	4749.96	0.88	-2576.63	0.00
3 Groups	4655.23	4751.79	4669.33	0.81	-2350.83	0.00
4 Groups	4569.92	4692.47	4587.81	0.88	-2301.62	0.00
5 Groups	4538.25	4686.80	4559.94	0.85	-2251.96	0.00
6 Groups	4498.27	4672.82	4672.82	0.87	-2229.13	0.00
7 Groups	4462.79	4663.33	4492.07	0.88	-2202.14	0.00
8 Groups	4437.47	4664.01	4470.55	0.88	-2177.39	0.00
9 Groups	4417.46	4669.99	4454.33	0.88	-2157.74	0.00
10 Groups	4396.34	4674.87	4437.01	0.89	-2140.73	0.00

Note. AIC = Akaike's Information Criterion; BIC = Bayesian Information Criterion; BLRT = bootstrap likelihood test.

Table 4 Posterior Probabilities of the Seven-Group Solution.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
Group 1	0.94	0.00	0.00	0.03	0.01	0.02	0.00
Group 2	0.00	0.91	0.01	0.04	0.00	0.02	0.01
Group 3	0.00	0.00	0.91	0.03	0.01	0.00	0.05
Group 4	0.08	0.01	0.02	0.83	0.06	0.01	0.00
Group 5	0.04	0.00	0.01	0.05	0.90	0.00	0.00
Group 6	0.06	0.03	0.01	0.01	0.00	0.89	0.00
Group 7	0.00	0.00	0.05	0.00	0.00	0.00	0.94

Note. Bold-faced values refer to average posterior probabilities for the group the individuals were assigned.

Profile Interpretation

The means of the RIASEC variables in each of the seven profiles can be seen in Figure 1. Profile interpretation was done using z-scores, but raw means can be seen in Table 5. Each profile was assigned a label to assist in the interpretation of the seven-group solution. To address Research Question 1, the relative profile elevation, differentiation, and consistency of the profiles were considered during the labeling process. Most aspects of Research Question 1 were supported with the exception of the hypotheses related to vocational identity (i.e., Hypothesis 1f, Hypothesis 1g). Two profiles were supportive of hypothesis 1e regarding high consistency. Additionally, one theory-consistent but un-hypothesized profile was identified which was typified by high

differentiation. Details regarding the supported hypotheses and seven profiles are reported below.

Seven interest profiles were identified, which are supportive of proposed hypotheses as well as interpretable within Holland's theory. In support of Hypothesis 1a, the first profile had the highest membership (n=93) and had almost equal male and female membership (50.5% women, 49.5% men). This profile was labeled *Low PE* because of the low overall profile elevation. In support of Hypothesis 1e, the second profile was notably smaller (n=31) and had a higher female membership (58.1% women). This profile was labeled *High Consistency SIA* because of the significantly above average scores on the Social, Investigative, and Artistic scales, respectively, and because of the high consistency of those RIASEC areas.

The third profile had a similar membership to the second profile in both size (n=28) and sex distribution (57.1% women). In partial support of Hypothesis 1d, profile 3 was labeled *Moderate Consistency CI* because of the above average scores on Conventional and Investigative and the moderate level of consistency between those two RIASEC areas. Hypothesis 1d hypothesized either a low consistency profile or one defined by a combination of interest areas not adjacent on the hexagon. Moderate consistency speaks to the latter half of that hypothesis. The fourth profile had a slightly higher membership than the second and third profiles (n=40) and almost equal male and female membership (52.5% women, 47.5% men). Profile 4 was labeled *Undifferentiated* because of the significantly below average endorsement of interest across RIASEC variables and supports Hypothesis 1c. The fifth profile had a similar membership to the second and third profiles in both size (n=33) and sex distribution (57.6% women). It was

labeled *High Differentiation, C Dominant* because of the well above average score on Conventional and the significantly below average scores on all other RIASEC areas. Although a well-differentiated profile was not explicitly hypothesized, this profile can be considered an additional, theory-supported profile. The sixth profile had the same number of members as the fourth profile (n=40) and had a higher male membership (60% men). As a second profile supportive of Hypothesis 1e, profile 2 was labeled *High Consistency IA* because of the significantly above average scores on Investigative and Artistic and the high level of consistency between those two RIASEC areas. Finally, supportive of Hypothesis 1b, the seventh profile was similar in membership size to the sixth profile (n=38) and had more male membership than female membership (57.9% men, 42.1% women). It was labeled *High PE* because of the high overall profile elevation.

In addition to the hypothesized profiles, Research Question 1 also addressed the hypothesized relationship between the interest profiles and vocational identity. When examining this using Wald's χ^2 test there were no significant mean differences between any of the profiles in regard to vocational identity. Thus, Hypotheses 1f and 1g were not supported.

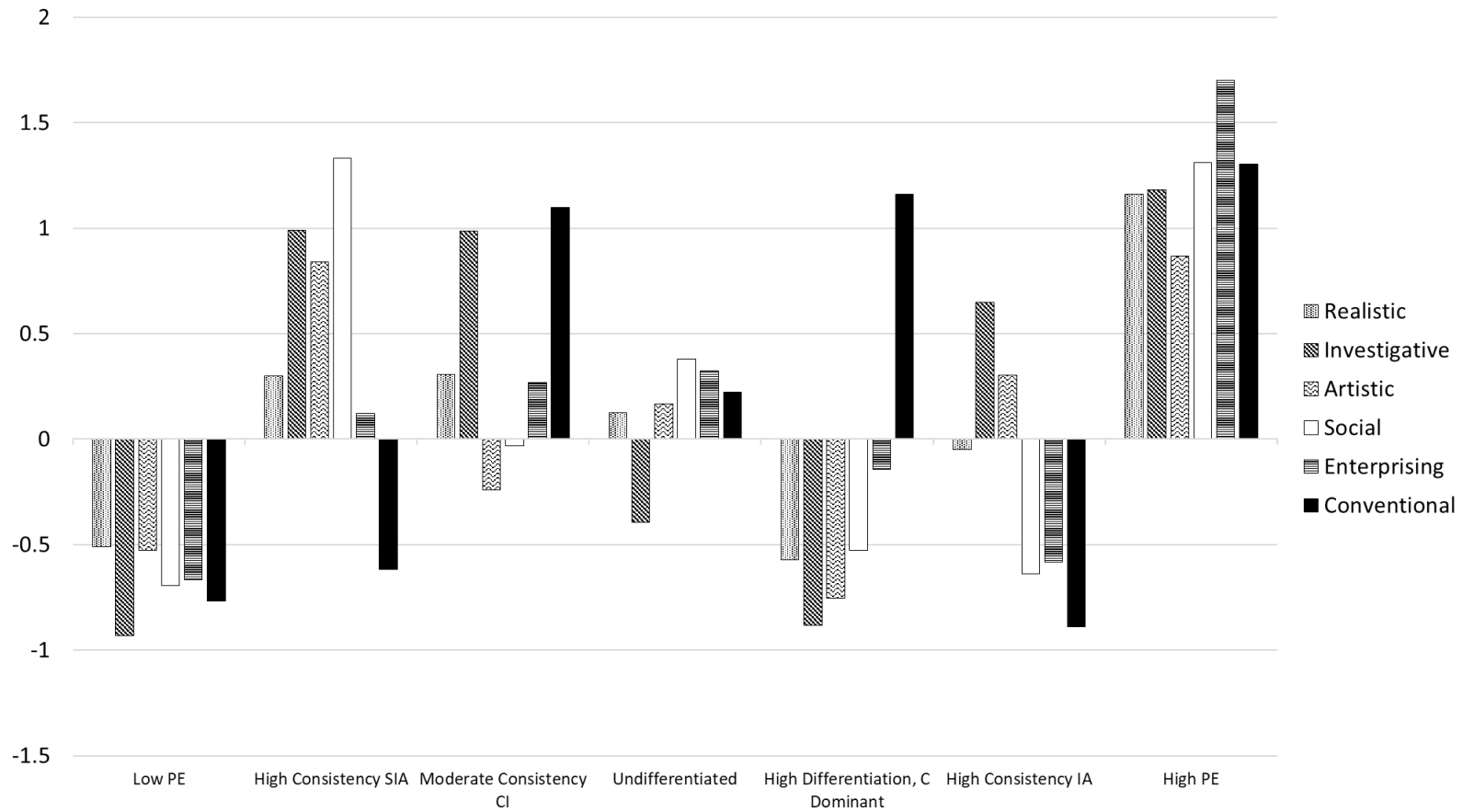


Figure 1. Scores on RIASEC for each profile.

Note: Scores were transformed to z-scores for easier interpretation.

FFM Variables and Sex in Relation to Profiles

Diagnostic signs, FFM, and sex variables were entered into the model as auxiliary variables to examine their relationship with each profile. Table 5 presents the mean scores for the RIASEC, diagnostic signs, and FFM variables across the seven profiles, as well as the sex distribution and Wald's χ^2 test results. Pairwise Wald's χ^2 tests were run for the diagnostic signs, FFM, and sex variables across classes, and the significance of these tests are noted in Table 5. Further, the means of the diagnostic signs and FFM variables across the seven profiles can be seen in Figure 2. Findings related to diagnostic signs will be detailed in the ancillary findings section as these findings are relevant to the support of the profiles but do not address specific hypotheses.

Regarding Research Question 2 that focused on the role of FFM variables, only Hypothesis 2a regarding the relationship between low profile elevation and low Extraversion was supported. Extraversion (Wald's $\chi^2 = 19.51$, $p < 0.05$) and Openness to Experience (Wald's $\chi^2 = 41.94$, $p < 0.05$) were the only FFM variables with overall significant mean differences. The High PE profile reported the highest amount of Extraversion, while the Moderate Consistency, CI profile had the lowest. The Low PE profile also was significantly below average on Extraversion and had a significant mean difference from the High PE profile, which is supportive of Hypothesis 2a. The High Consistency SIA profile had the highest Openness to Experience value, while the High Differentiation, C Dominant profile had the lowest. Although there was no profile identified as being typified by low consistency, the high Openness to Experience value on the High Consistency SIA value is not supportive of Hypothesis 2c in that it was expected that a profile which exhibited low consistency would be related to high levels of

Openness to Experience. Further, Neuroticism and Conscientiousness did not have significant overall mean differences across profiles. Thus, Hypotheses 2b and 2d were not supported.

No hypotheses related to Research Question 3 were supported given that neither sex nor Neuroticism or Agreeableness had significant overall mean differences across profiles. Further information regarding sex differences can be found in the ancillary findings section.

Table 5 Means of Study Variables Across Seven Profiles

	Low PE	High Consistency SIA	Moderate Consistency CI	Undifferentiated	High Differentiation, C Dominant	High Consistency IA	High PE	
	n=93	n=31	n=28	n=40	n=33	n=40	n=38	
% Women, % Men	50.5, 49.5	58.1, 41.9	57.1, 42.9	52.5, 47.5	57.6, 42.4	40, 60	42.1, 57.9	Global Wald's χ^2
Realistic	4.39	4.95	10.48	19.53	12.01	12.08	8.97	
Investigative	6.20	5.74	10.96	26.28	24.38	24.36	21.08	
Artistic	5.67	7.70	13.86	20.09	19.84	10.24	15.08	
Social	6.30	4.74	14.78	23.48	23.67	10.95	5.27	
Enterprising	7.77	3.65	11.45	22.30	9.86	11.02	4.30	
Conventional	23.84	4.75	14.54	25.25	6.22	23.23	3.54	
Profile Elevation	31.46 _c	96.04 _a	91.79 _a	76.31 _b	54.09 _b	58.51 _d	137.15 _e	815.65*
Consistency	2.28 _a	2.39 _a	2.20 _a	2.06 _a	2.36 _a	2.82 _b	2.32 _a	43.61*
Differentiation	3.75 _a	4.70 _b	4.38 _{a,b}	3.74 _{a,b}	7.65 _c	6.58 _c	1.88 _d	230.80*
Vocational Identity	10.34	10.97	9.96	10.45	10.06	10.57	9.02	3.32
Neuroticism	66.72	61.95	70.72	64.11	64.91	62.10	59.75	4.85
Extraversion	71.08 _a	81.12 _b	69.81 _a	75.86 _{a,b}	71.25 _a	72.27 _a	82.11 _b	19.51*
Openness to Experience	77.84 _{a,b}	87.97 _d	84.82 _{c,d}	80.25 _{a,c}	73.75 _b	87.14 _d	83.46 _{c,d}	41.94*
Agreeableness	88.83	96.88	91.79	90.14	92.33	91.81	93.75	10.35
Conscientiousness	91.35	91.80	92.10	91.79	94.59	92.53	94.70	1.23

Note. Means with different superscripts are significantly different ($p < .05$), while those sharing a superscript do not significantly differ. Interest scores are reported as raw scores. * $p < .01$.

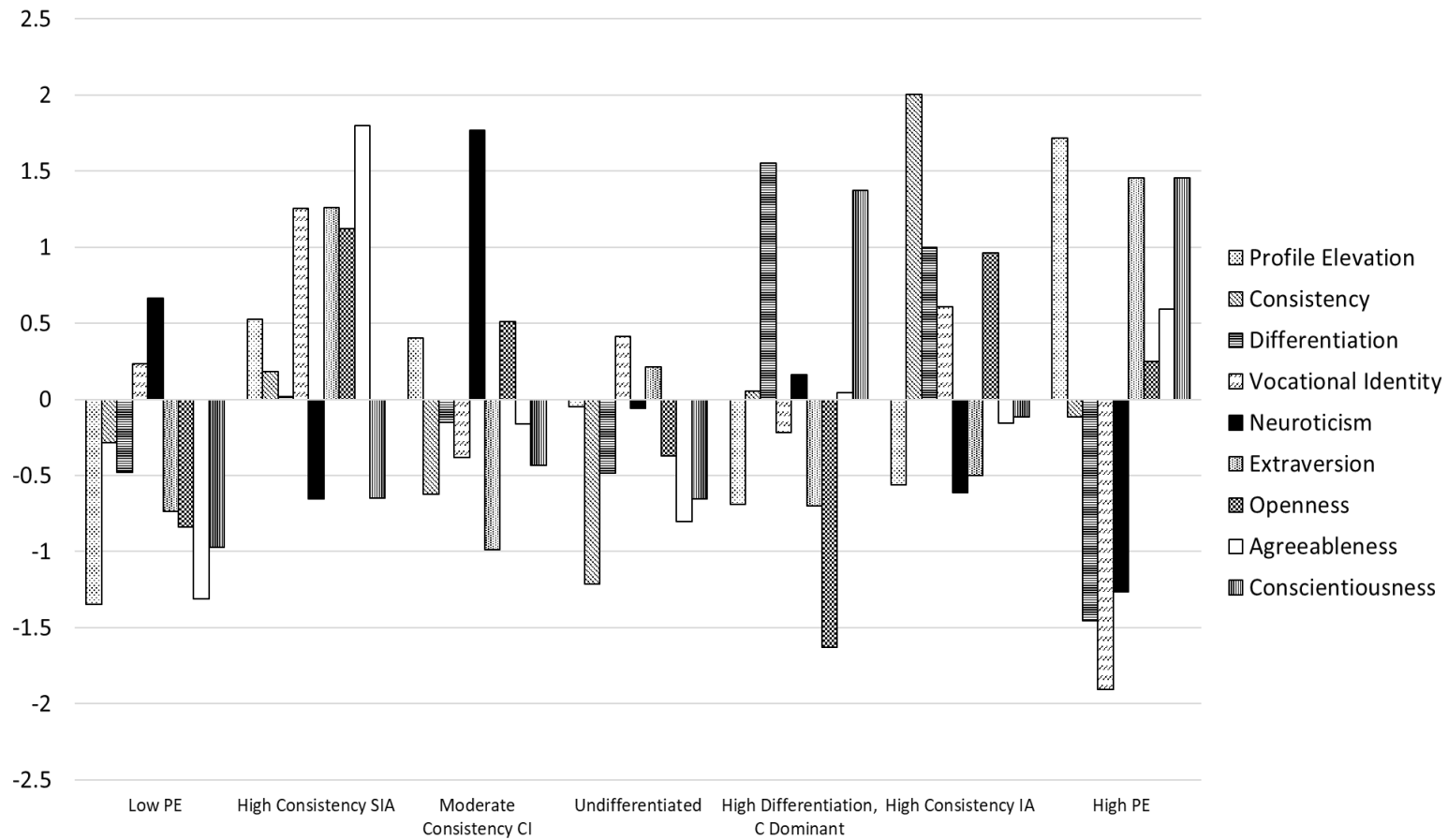


Figure 2. Means of diagnostic signs and FFM variables across the seven career interest profiles.

Note. Scores were transformed to z-scores for easier interpretation.

Ancillary Findings

Ancillary findings are presented below. These results provide additional justification for the naming of the interest profiles, as well as detail trends in the data related to sex differences in profile membership.

In regard to diagnostic signs, there were overall significant differences in mean scores across profiles for profile elevation (Wald's $\chi^2 = 815.65$, $p < 0.01$), consistency (Wald's $\chi^2 = 43.61$, $p < 0.01$), and differentiation (Wald's $\chi^2 = 230.80$, $p < 0.01$), but not for vocational identity. As expected, the High PE profile (profile 7, supportive of Hypothesis 1b) had the highest profile elevation value and the Low PE profile (profile 1; supportive of Hypothesis 1a) had the lowest. Profile comparisons related to profile elevation revealed significant mean differences between the High PE, High Consistency IA, and Low PE profiles and all other profiles.

Not surprisingly, the High Consistency IA profile (profile 6; supportive of Hypothesis 1e) had the highest consistency value, while the Undifferentiated profile (profile 4; supportive of Hypothesis 1c) had the lowest. Comparisons on the consistency variable resulted in significant mean differences between the High Consistency IA profile and all other profiles. However, there was no significant difference between the High Consistency SIA (profile 2; supportive of Hypothesis 1e) and Moderate Consistency CI (profile 3; partial supportive of Hypothesis 1d) profiles. A significant difference would have been expected had the Moderate Consistency CI profile been a low consistency profile, rendering this finding theory consistent. For differentiation, the High-Differentiation, C Dominant (profile 5; not hypothesized) profile had the highest value and the High PE profile (profile 7; supportive of Hypothesis 1b) had the lowest. Profile

comparisons related to differentiation were more nuanced than the comparisons related to profile elevation and consistency and can be viewed in Table 5. Although there was no overall significance for vocational identity (Wald's $\chi^2 = 3.32, p > 0.05$), the value was the highest on the High Consistency Helper profile and lowest on the High PE profile.

While there were no significant results supporting hypotheses related to sex differences in profiles, there were some interesting trends in the data. It was expected that profiles higher in Realistic, Investigative and Enterprising interests would be more prevalent in men. Overall mean differences in sex were not significant across profiles, nor were pairwise tests between profiles. However, the profile with the highest proportion of men (High Consistency IA, 60%) did have the highest value on Investigative across RIASEC variables within that profile. However, other profiles had higher values on Investigative than the High Consistency IA profile and were comprised of similar amounts of men and women (e.g., High Consistency SIA with 58.1% women, 41.9% men). The highest Realistic and Enterprising values were both in the High PE profile, which had only a slightly larger male membership (i.e., 42.1% women, 57.9% men). It was also expected that profiles higher in Conventional interests would be more prevalent in women. The profiles with the highest values on Conventional interests (i.e., Moderate Consistency CI; High Differentiation, C Dominant; High PE), again, had similar sex membership (see Table 5). The High Consistency SIA profile had the highest proportion of women (i.e., 58.1%), but had a below average value on Conventional interests.

CHAPTER IV – DISCUSSION

The current study sought to expand the theory, typology, and validity of research on Holland's theory by examining the presence of interest profiles. Additionally, the current study aimed to provide a more practically applicable, person-centered, theory-integrative account of interest profiles. This integration of theory, research, and practice is meant to continue the development of Holland's theory and answer Holland's call for more research on his theory, particularly his call for research of flat or rare profiles (Holland, 1997).

While other recent research in Holland's theory and vocational interests has made progress in the integration of research and practice, the research seems to lack a solid grounding in theory. The use of Holland's diagnostic signs in this study was an intentional attempt to explore the structure of RIASEC interests in a practically-applicable manner without losing the other foundational aspects of the theory. Thus, to fully address the integration of theory, research, and practice, the current study utilized a person-centered approach to data analysis (i.e., latent profile analysis) to examine the relationship of RIASEC variables between individuals while also incorporating diagnostic signs in the analysis and interpretation of results. Specifically, the results of this study provide empirical support to the value of utilizing diagnostic signs in the interest inventory interpretation process.

The results of the current study support seven distinct profiles of vocational interest. Although the study by McLarnon et al. (2015) found support for eight profiles, there were some similarities between studies. For example, both studies found profiles with below average scores on all RIASEC areas (i.e., Disinterested and Low PE) as well

as profiles with average and similar scores across RIASEC areas (i.e., Neutral and Undifferentiated). Further, each study found profiles with one clearly dominant RIASEC area (i.e., Investigative-dominant and High Differentiation, C Dominant).

Other profiles found in the current study were not highly similar to those in the McLarnon et al. (2015) study but were theory-consistent in their structure. In fact, the structure of each of the seven profiles were explained using Holland's diagnostic signs of profile elevation, consistency, and differentiation. The only diagnostic sign that was not found to be significantly related to the interest profiles was vocational identity. While identity was not hypothesized to directly influence the structure of the profiles, it was expected that identity would differ significantly across profiles. This was not true in the current study's sample, as there was not a profile that was typified by a high or low level of vocational identity. Nauta (2010) noted that individuals with well-defined identity often have well-differentiated and consistent vocational interests. Thus, it would be expected that there would be significant relationships between vocational identity and the profiles typified by both differentiation and consistency. Again, this was not found in the current study, nor were these diagnostic signs significantly correlated. However, some research (e.g., Leung et al., 1992) found that identity, consistency, and differentiation have no relationship with each other and posited that this may be due to the diagnostic signs representing different phenomena or due to identity being a "fuzzy concept" (p. 105). Also of note was that the current study did not find a profile that was dominated by Realistic interest, while McLarnon et al. (2015) and other studies have found. This may be due to the low likelihood of individuals with Realistic interests completing online surveys.

Several relationships between FFM variables and interest profiles were hypothesized. Extraversion was found to be related to interest profiles as expected in that Extraversion was lowest in the Low PE profile, indicating that those with low levels of overall interest also tend to be less outgoing, less cheerful, and less likely to seek excitement. Openness to Experience differed significantly across profiles, but the related hypothesis was not supported as it was expected that Openness to Experience would be related to low consistency profiles. Not only were no low consistency profiles identified, but also Openness to Experience was highest in the High Consistency Helper profile. This was particularly interesting in that individuals with highly consistent interests may not be viewed as open to experiences as their interests are more focused. Perhaps those with Social, Investigative, and Artistic interests are more open to people and their ideas. Another possible explanation for this unexpected relationship is that the individuals in the High Consistency SIA profile may exhibit more variety in their leisure interests, which were not assessed in the current study. Leuty et al. (2015) also examined profiles of interest but included both vocational and leisure interests. They found that Openness to Experience was above average on their “leisurites” profile, which was given this name due to the high endorsement of leisure interests (Leuty et al., 2015). Although RIASEC scores on the “leisurites” profile were somewhat similar, the top two scores were in Investigative and Artistic which are highly consistent.

Conscientiousness and Neuroticism did not differ significantly across the seven study profiles, although they were expected to be significantly related to profiles with high consistency and high profile elevation, respectively. It was expected that Conscientiousness would be significantly related to highly consistent profiles as

Conscientiousness has been related to traits such as being dependable and persistent (Mount et al., 2005) and high consistency is related to predictable interests (Holland, 1997). While pairwise comparisons cannot be confidently made due to the insignificant difference of Conscientiousness across profiles, it is worth noting that Conscientiousness was below average on both the High Consistency SIA and Moderate Consistency CI profiles. However, Conscientiousness was well above average and significantly higher than other FFM variables on the High Differentiation, C Dominant profile. This is an interesting trend, as Conscientiousness has been found to have a significant relationship with Conventional interests (Larson et al., 2002; Mount et al., 2005). When examining the High Consistency Helper profile, the lowest RIASEC score was on Conventional, which was well below scores on all other RIASEC interests for that profile. Further, individuals in the current study sample had higher than average scores on Conscientiousness, as evidenced by their range of scores (i.e., 52-120) compared to the possible range of scores (i.e., 24-120). When considering these factors, it is possible that the current study sample did not show significant differences in Conscientiousness across profiles overall due to its high overall level of Conscientiousness and due to the low level of Conventional interests in the one profile labeled as highly consistent.

It was expected that Neuroticism would be significantly related to profiles with high profile elevation as Neuroticism has been related to traits such as self-consciousness, anxiety, impulsiveness, and indecisiveness (e.g., Block, 1995; Fuller et al., 1999), and high profile elevation has been related to traits such as being enthusiastic and impulsive (e.g., Gottfredson & Jones, 1993). Previous studies have posited a negative relationship between Neuroticism and profile elevation (e.g., Fuller et al., 1999). However, this

relationship has not always been supported (e.g., Bullock & Reardon, 2008). The current study sought to explore the possibility that the impulsivity and indecisiveness within Neuroticism may be significantly related to the impulsivity and enthusiasm for many interests within profile elevation. As with Conscientiousness, pairwise comparisons cannot be confidently made due to the insignificant difference of Neuroticism across profiles. Nevertheless, it is worth noting that Neuroticism was highest in the Moderate Consistency CI profile. Although decisiveness was not measured in the current study, one possible explanation for the aforementioned elevation may be some indecisiveness in interests present in individuals with moderate consistency. The relationship between Neuroticism and career indecision has received some support (e.g., Tokar, Fischer, & Subich, 1998), but a measure of career decision-making would be needed to make such an assertion in the current findings.

The current study also hypothesized differences in profile membership and in the relationships between profiles and FFM variables based on sex. None of the hypotheses in Research Question 3, which all related to sex, were supported. It was expected that profiles high in Realistic, Investigative, and/or Enterprising interests would be more prevalent in men, while profiles high in Conventional interests would be more prevalent in women. There were no significant differences found in sex across profiles. This is consistent with mixed results for these relationships in previous literature related to sex differences in vocational interests (e.g., Hansen et al., 1993; Kantamneni, 2014), although the expectation was that a more gender-balanced sample than those utilized in similar studies (e.g., McLarnon et al., 2015) would yield significant results. Although there were no significant sex differences across profiles, trends in the current study data did indicate

slightly higher male membership in profiles with above average endorsement of Realistic, Investigative, and Enterprising interests, and slightly higher female membership in some profiles with above average endorsement of Conventional interests.

Also expected in the current study was that profiles significantly related to Neuroticism would be more prevalent in women and profiles significantly related to Agreeableness would be more prevalent in men. These hypotheses were consistent with findings in literature that have examined sex differences in the relationship between vocational interests and personality (e.g., Kieffer et al., 2004; Schinka et al., 1997). However, neither Neuroticism nor Agreeableness were significant across profiles. Again, it was expected that a more gender-balanced sample like the one utilized in this study would yield significant findings in sex differences, yet findings of the current study suggest that sex differences in vocational interest profiles may not be apparent.

Limitations and Future Directions

Although intentional changes were implemented in the current study to more fully integrate theory, research, and practice, certain limitations in the current study still exist. Previous, similar studies (e.g., McLarnon et al., 2015) suggested that a more diverse sample be utilized in researching profiles of vocational interest. An ethnically diverse sample was expected for the current study, given that MTurk workers tend to vary in ethnicity, gender, socioeconomic status, and age (Arditte et al., 2016; Mason & Suri, 2012; Paolacci et al., 2010). However, the current study's sample was largely white (i.e., 77.9%). Future research should strive for a sample more variable in ethnicity.

Another possible limitation of the current study is its use of LPA instead of FMM. FMMs have been utilized in other studies which exploring vocational interests (e.g.,

Leuty et al., 2015; McLarnon et al., 2015) to avoid violating the assumption of conditional independence as RIASEC interests are often significantly correlated (Johnson & Bouchard, 2009; Leuty et al., 2015; Tay et al., 2011). An FMM was attempted in the current study, but a well-fitting model solution was not identified. As previously mentioned, this could be due to the general interest factor (i.e., the factor modeled in FMMs of vocational interest) not being present in the current study sample. Although the general interest factor has been supported in previous studies (e.g., Tay et al., 2011) there are also several criticisms, such as the factor representing profile elevation or being a nuisance variable (e.g., Tracey, 2012). Additionally, there were interesting differences when comparing RIASEC variable means in the current study to those of Lewis and Rivkin (1999). While Lewis and Rivkin (1999) found that Social had the highest mean, while Investigative had the highest mean in the current study. Social was actually the fourth highest RIASEC mean. Also, when putting the RIASEC means in rank order from highest to lowest, none of the RIASEC areas were in the same rank position when comparing the findings of Lewis and Rivkin (1999) to the current study. This indicates several differences between the interests of the current study's sample and the normative sample (Lewis & Rivkin, 1999) which may have also contributed to the absence of a general interest factor in the current study. Regardless, a common factor model to account for a general interest factor was not utilized in this study. One possible reason that this model was not a good fit for the current study is that the sample was somehow different from previous study samples in which a general interest factor was modeled. Both McLarnon et al. (2015) and Leuty et al. (2015) utilized college student samples, while the current study utilized an MTurk sample. It is possible that vocational interest

patterns are somehow different in MTurk samples than college student samples, or that the general factor of interest is for some reason a nuisance variable for MTurk samples. Another potential reason for model differences may be sample size. The current study sample size is similar to that of McLarnon et al. (2015) and falls within the acceptable sample size range in literature regarding LPA (e.g., Nylund et al., 2007). However, a larger sample size could yield different results, including potentially aiding convergence in an FMM should sample size have been a precluding factor in the current study. Thus, future studies may explore these proposed limitations by using a larger MTurk sample in a replication or expansion of the current study.

Finally, future research may incorporate additional measures to examine relationships between vocational interest profiles and other variables of interest. For instance, certain mental health variables (e.g., depression) have been incorporated in previous studies of vocational interests and diagnostic signs (e.g., Fuller et al., 1999). It would be of interest to examine the relationship between mental health variables such as depression and anxiety and vocational profiles of interest, as these relationships would be useful for practitioners to understand when working with career counseling clients. Understanding these relationships could help practitioners to make appropriate referrals and help clients understand how their interests may be impacted by their mental health.

Theoretical Implications

The current study not only presents an important addition to the literature in person-centered analyses of vocational interests, but also provides empirical support for the theoretically-consistent diagnostic signs of Holland's theory. Previous studies have found latent profiles of vocational interest that are characterized by different levels of

RIASEC interests (Leuty et al., 2015; McLarnon et al., 2015). The current study advanced this research by intentionally utilizing other aspects of Holland's theory (i.e., diagnostic signs) in the interpretation of interest profiles. Diagnostic signs were represented in the visual inspection of the current study's profiles. Further, certain diagnostic signs were statistically significant in distinguishing between profile membership in follow-up analyses. Often, these diagnostic signs are omitted from research utilizing Holland's RIASEC interests, as studies are not fully grounded in the theory or focused on its expansion or validity. The inclusion of these diagnostic signs is particularly important in that their absence from many studies has limited the amount of knowledge we have about them and how they function. Holland noted the importance of diagnostic signs in his 1997 book when he stated, "It is useful to think of consistency, differentiation, and identity not only as estimates of the clarity or definition of a personality, but also as estimates of the variety of personality repertoires that a person will exhibit" (p. 33). The current study found empirical evidence to support this statement. The continued inclusion of diagnostic signs in studies of vocational interests, especially those utilizing a person-centered approach, can help to further understand the influence of diagnostic signs on not only the structure of interests but also vocational outcomes such as satisfaction and success.

Results from the current study also inform the need to reconsider how vocational interests are organized. This need has been discussed in recent studies of vocational interests (e.g., Leuty et al., 2015; McLarnon et al., 2015), as person-centered analyses have revealed mixed support for previous organizations of vocational interests such as Prediger's (1982) bipolar dimensions of interest (i.e., people versus things, data versus

ideas) and Tay et al.'s (2011) bivariate conceptualization of interest. The conclusions of the current study are aligned with those of McLarnon et al. (2015) in that results appear to support a multivariate conceptualization of interest. McLarnon et al. (2015) noted that their multivariate framework "is characterized by nonmutually exclusive variables that combine and interact in a complex manner" (p. 180). This was also true of the current study, in that the pattern of interests in the profiles were explained in the context of Holland's diagnostic signs but were not restricted to a bipolar or bivariate interpretation based on certain RIASEC areas. Thus, the current study builds upon the work of McLarnon et al. (2015) by highlighting distinct types of interests with an explanation supportive of RIASEC theory (Holland, 1997).

The relationship between vocational interests and personality was also supported in this study. The current study's findings were similar to those in the meta-analyses conducted by Barrick et al. (2003) and Mount et al. (2005) in that Extraversion and Openness to Experience were the FFM variables that were significantly different across profiles. Although not all of the hypothesized relationships related to these FFM variables were supported, their statistical significance in the current study further supports their theoretical relevance in understanding vocational interests as well as how they may be understood in the context of Holland's theory. Future research may consider exploring the direct relationship between Extraversion, Openness to Experience, and Holland's diagnostic signs to provide further support to the conceptualization of interest profiles using diagnostic signs.

Finally, the current study's findings were similar to those in previous studies that found no significant differences in vocational interests based on sex. These findings

should not be dismissed as unimportant because of lacking statistical significance. In contrast, the findings highlight the differences between how men and women seem to perceive vocational interest, and what vocational interests they endorse. Previous findings have shown that women and men perceive vocational interests differently (e.g., Hansen et al., 1993). However, studies investigating the presence of sex differences in vocational interest endorsement have mixed results (e.g., Kieffer et al., 2004; Larson et al., 2002). While McLarnon et al. (2015) and Leuty et al. (2015) found some differences in profile membership based on sex, the current study did not find such differences with a sex-balanced sample. Thus, it is important that future studies utilize sex-balanced samples, as found in the current study, and consider perception versus endorsement of interests when making claims about the theoretical implications of sex differences in vocational interests. Additionally, while sex differences are more commonly found in variable-centered approaches, findings of the current study and previous studies using a person-centered approach may suggest that there are fewer differences related to sex when organizing interests into profiles.

Practical Implications

As previously mentioned, a major aim of the current study was to further the integration of theory, research, and practice in relation to Holland's theory. By intentionally incorporating theory and utilizing methodology conducive to the practical application of results, the current study's findings can provide better direction for career counseling practitioners in their work with clients. The current study explained profiles of vocational interest in the context of diagnostic signs in Holland's theory. This provides support for the importance of going beyond RIASEC area endorsement to interpret the

results of interest measures. Reardon and Lenz (2015) regularly note practitioners' tendency to only interpret interest inventory results from the perspective of RIASEC scores, ignoring the theory's diagnostic signs. Holland's theory (1997), and now the current study's findings, support the use of diagnostic signs in making more individualized interpretations of interest results. The incorporation of diagnostic signs may aid career counseling clients in understanding how their RIASEC interests function for them holistically. Previous research (e.g., Nye, Su, Rounds, & Drasgow, 2012) has noted the significance of vocational interests in predicting outcomes such as job performance. Thus, if career counseling practitioners are able to aid clients in understanding their results holistically, clients may be better equipped to make informed vocational choices which may lead to better vocational outcomes. The current study findings can help to inform this issue.

As previously mentioned, the current study utilized a person-centered method of data analysis (i.e., latent profile analysis). Person-centered analyses allow researchers to explore vocational interests without the assumption that all individuals' interests are structured in the same way. Thus, results from person-centered analyses allows practitioners to more confidently integrate recommendations from these studies in their practice with a diverse career counseling client base. The findings in the current study highlight the importance of utilizing the entire profile of interests and diagnostic signs in interpreting vocational interests, as they were significantly different across profiles. For instance, a practitioner may use their knowledge of vocational interest profiles to anticipate endorsement of the RIASEC variables (e.g., a person with a high interest in

Social may have low interest in Conventional according to the High Consistency SIA profile).

It may also be of interest for career counseling practitioners to incorporate measures of personality in their work with clients. The current study and previous research have found connections between RIASEC areas and FFM variables, especially Extraversion and Openness to Experience. Knowing a client's level of endorsement on these and other FFM areas may also aid practitioners in helping their clients to understand how their vocational interests affect them holistically. More specifically, a practitioner can investigate how consistent clients' endorsements on vocational interest and personality measures are in relation to previous research findings on the co-occurrence of elevations in certain areas. This can lead to the completion of other formal or informal assessments (e.g., mental health screeners, values assessments) to better understand the client's values, interests, and skills so that they may make a more informed and individualized career decision. This may also lead to practitioner insight related to a client's well-being, which may aid in providing referrals to additional services if needed.

Finally, career counseling practitioners may consider differences in their provision of services to clients based on sex. As previously mentioned, there have been mixed results in vocational interest literature regarding sex-based differences in both perception and endorsement of interests (e.g., Kieffer et al., 2004; Larson et al., 2002). While the current study found no significant differences in interest profiles based on sex, there was no measure of perception of interests. Regardless, it could be of use for practitioners to incorporate conversations regarding perception of career interests when

working with clients to interpret their interest measure results, so they may be able to identify potential sex-based biases regarding career interests.

Case Example

To illustrate the points from practical application section, consider a fictional client named Jane. She presents to a career counseling session to gain more clarity about her vocational interests. She is given a variety of assessments, including a measure of RIASEC interests. When discussing the results with her career counselor, Jane discovers that she has a Holland code of ESC. Jane and her counselor review occupations with the ESC code, and Jane does not appear to be interested in any of the options. Her counselor wants to help Jane find one or more occupations that are interesting to her but feels at a loss for how to move forward. Using a person-centered, profile approach to Jane's interest can help the counselor.

Using a profile to interpret Jane's interests, the counselor sees that Jane's interest profile resembles the High PE profile when considering all the RIASEC areas. In addition to having high profile elevation, her top vocational interests are consistent, and her interests are not well differentiated. When the career counselor discusses the diagnostic signs with Jane, she learns that while Enterprising, Social, and Conventional are the highest of her RIASEC scores she also has a high level of interest in other RIASEC areas as well. She also learns that while her top two RIASEC areas are theoretically similar (i.e., high consistency), her high level of interest in other RIASEC areas may be similarly appealing to her. Jane's diagnostic signs are helpful for the counselor as well. Despite her top interests being consistent, a high level of profile elevation coupled with largely undifferentiated interests may indicate that Jane would have trouble with career decision-

making as she has a wide variety of interests. Thus, the counselor's use of diagnostic signs in interpreting Jane's interests could help to efficiently assess other vocational concerns before they become problematic for Jane. Reardon and Lenz (2015) suggest that when presented with an interest profile involving high profile elevation and undifferentiated interests, the counselor should consider exploring several iterations of the interest code with the client. It may be that Jane's interests across nearly all RIASEC areas are not significantly different and her desired work environment may not be dominated by Enterprising or Social as her Holland Code suggests. Taking the time to look at all of her high scoring areas of interest may be more fruitful in finding a top interest area for Jane, rather than narrowing down too quickly. Hirschi and Läge (2007) also found that profile elevation and differentiation are related to attitudes toward career exploration and planning, as well as decidedness and career-choice readiness. Thus, Jane may be engaging in exploration but also feeling stuck when making a decision. On the other hand, if Jane's interests reflected high profile elevation but were well differentiated around her top two areas of interest, narrowing her choices and making a satisfying decision may be a more straightforward process requiring less practitioner intervention.

Both the current study findings and previous research indicate that individuals with high profile elevation typically also have high Extraversion. In the case of Jane, it would be expected that if she was given a measure of FFM traits, the counselor should have hypothesized that she may be likely to endorse a high level of Extraversion. Regardless, it can be helpful for the counselor and client alike to acquire data related to personality through measures. Because the counselor has this data and can share it with Jane, they are able to discuss the results and their implications. Jane reports that she does

feel that she is extraverted, and that she wants to be able to incorporate her Extraversion into a career. Thus, the counselor and Jane can create a treatment goal related to helping Jane find a career that is suited for individuals who are extraverted.

After discussing her interests and personality with her counselor, Jane becomes interested in the occupation Shopping Investigator that she sees in the Occupations Finder (Holland & Messer, 2017) under the ESC codes. After looking into this occupation on the O*Net website with her counselor, Jane seems to lose interest rapidly. The counselor shares this observation with Jane, and Jane says that she is disappointed that the occupation is similar to law enforcement. When the counselor asks for more details about Jane's disappointment, Jane states that she feels she cannot be in this occupation as it seems to be a job for men. Knowing this, the counselor may choose to have a further discussion with Jane about sex biases in the perception of vocational interests and how she could still pursue this occupation. This discussion could be helpful in that Jane endorsed high Enterprising interests, as well as other interests common in male-dominated occupations (e.g., Realistic and Investigative). Although she endorsed these interests, Jane appears to feel that she cannot participate in certain occupations that she perceives to be male-dominated. There is a discrepancy in Jane's endorsement of interests and her perception of the occupations related to those interests. If her perception of sex differences in occupations is not addressed, this may lead her to pursue an occupation that she is less interested in because it seems to be more female-dominated or female-friendly in nature. Thus, the counselor's awareness of these sex-related issues could aid Jane in addressing a barrier in career decision-making that both she and the counselor may have otherwise missed during their session.

In conclusion, there are obviously many factors that should be taken into consideration in the provision of career counseling services. Although this case example does not provide an exhaustive illustration of the things that should be considered by practitioners, it highlights the importance of using recommendations from studies that implement a person-centered approach to data analysis. Profile interpretation that incorporated both diagnostic signs and information on all RIASEC areas allowed the counselor to help Jane understand her interests in a more nuanced manner. Also, understanding the relationship between vocational interest profiles and personality and sex aided in the understanding of how these areas were related for Jane. These things were made possible through the use of the knowledge gleaned from research using a person-centered approach.

Summary and Conclusion

In sum, the current study has provided support for the presence of seven profiles of vocational interest that may be explained in the context of Holland's theory diagnostic signs. Extraversion was also found to discriminate between these profiles in the manner expected. No significant sex differences were found across profiles. Practical implications of fully integrating the theoretically-consistent and empirically supported diagnostic signs in the person-centered process of vocational interest profile interpretation were also demonstrated through the case of "Jane." These results support the integration of theory, research, and practice in the study of vocational interests, and replication and expansion of the current study is encouraged.

APPENDIX A – IRB Approval Letter



THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD

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NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 17011902

PROJECT TITLE: Latent Profiles of Interest in Holland's Theory in Relation to Personality and Sex

PROJECT TYPE: New Project

RESEARCHER(S): Erica Mathis

COLLEGE/DIVISION: College of Education and Psychology

DEPARTMENT: Psychology

FUNDING AGENCY/SPONSOR: N/A

IRB COMMITTEE ACTION: Expedited Review Approval

PERIOD OF APPROVAL: 02/10/2017 to 02/09/2018

Lawrence A. Hosman, Ph.D.

Institutional Review Board

APPENDIX B – Electronic Informed Consent

Informed Consent

The purpose of this study is to investigate profiles of vocational interest and explore their relationship to personality variables and sex. The profiles will be explored in the context of Holland's theory, one of the most widely used theories of vocational interest. Results from this study will aid career counselors in understanding individuals with more nuanced vocational interests and allow them to integrate information about clients' personality and sex in how it may affect individuals' career planning.

Participation will involve completing several questionnaires and a biographical information sheet. The questionnaire items will relate to your interests and personality. An internet link to the questionnaire items will be provided through Amazon Mturk's website. Participation will take approximately 30 to 60 minutes to complete. Quality assurance checks will be used to make sure that participants are reading questions carefully and answering thoughtfully. It is not necessary to over-think any item but to fully read and respond thoughtfully to each item. Indication that participation in this survey was not given your full attention may result in no compensation.

Upon completion of the survey materials, 0.25 cents will be deposited into your MTurk account. The risks associated with participation are minimal. You may find that a few of the questions are sensitive in nature or difficult to answer. Additionally, you may become bored or fatigued when completing questions. However, some individuals may report having greater self-awareness of their interests and experiences by responding to survey questions.

If you feel that completing these questionnaires has resulted in emotional distress, please stop and notify the researcher (erica.mathis@usm.edu). If you should decide at a later date that you would like to discuss your concerns, please contact the research supervisor, Dr. Emily Yowell (emily.yowell@usm.edu). Participation in this study is voluntary. You are free to not answer any question or withdraw at any time. However, if you do not complete the survey measures, you will not be compensated.

The records of this study will be kept private. You will not be asked to provide your name. In any sort of report that might be published from this data, no information will be included that will make it possible to identify you. Research records will be stored securely and only the researchers involved in this study will have access to the research records.

The project has been reviewed by the Institutional Review Board, which ensures that research projects involving human subjects follow federal regulations. Any questions or

concerns about rights as a research participant should be directed to the Manager of the IRB at 601-266-5997. Participation in this project is completely voluntary, and participants may withdraw from this study at any time without penalty, prejudice, or loss of benefits.

Any questions about the research should be directed to the Principal Investigator using the contact information provided above.

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